

February 26, 1998

TO: 544/Claudia LeBoeuf

FROM: 543/David Robinson

SUBJECT: Margins of Safety on DCATT Structures

The margins of safety have been calculated on all the primary structural elements of DCATT. All margins of safety were found to be positive.

There are over 100 components in the DCATT primary structure in 6 assemblies. The following is a summary showing the components that had the lowest margin of safety in their respective assembly.

Assembly	Minimum MS	Details
AO Bench Frame	3.6	Per McGinnis' FEM: One segment of the bench frame
Telescope Handling Fixture	4.2	Long triangle beams which the primary baseplate rests on
Optical Flat Handling Fixture	2.2	Long triangle beam which the AC Flat hangs from
Telescope Metering Structure	0.18	Blade (assuming all of secondary mirror hangs on one blade)
AC Flat Collar Assembly	0.36	Per McGinnis' FEM: Collar Block piece during 2-point rotation operation
Hindle Mount Assembly	0.85	Ball Joint Rod End (commercial part)

To compute the margin of safety, first the stress was determined, then a factor of safety of 5.0 was used to de-rate the material strength from MIL-HDBK-5G. If the component was a commercial part, then the advertised load rating was divided by 5.0. The margin of safety formula was:

$$M.S. = \text{derated strength} / \text{max stress} - 1$$

For most of the components, a hand calculation was performed. Conservative assumptions were used in all cases. A few of the components with more complex geometry and load paths required a finite element model which was either done by Mark McGinnis/542 or myself. These parts included the AO Bench Frame, the AC Flat Collar Assembly, the Hindle Mount mushrooms, sockets, and triangle plates.

A copy of the detailed hand calculations is enclosed in attachment 1. Also included are the FEM results of the stress on the Hindle Mount triangle plate, socket, and mushrooms.

The FEM results of the AO Bench Frame and the AC Flat Collar Assembly are covered in a separate memo by Mark McGinnis/542.

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David Robinson

CC w/o attachment: 551/Pam Davila  
544/Armando Morrell  
544/Rick Fedorchak  
543/Branch Files